

REMARKS

In view of the above amendments and following remarks, reconsideration of the rejections contained in the Office Action of March 4, 2003 is respectfully requested.

The entire specification and abstract have been reviewed and revised in order to make various editorial corrections. For the Examiner's convenience, a copy of the marked-up original specification and abstract is also enclosed, and the marked-up pages are captioned "Version with markings to show changes made." No new matter has been added by these revisions. Due to the number of corrections, a substitute specification incorporating these changes has been prepared and submitted herewith. Entry of the substitute specification is thus respectfully requested.

The Examiner has rejected claim 5 under 35 U.S.C. 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as being obvious over either the Eckles reference (USP 4,326,940) or the Heberling reference (PC FAB, August 1989, pages 72-84). Furthermore, the Examiner has rejected claim 6 under 35 U.S.C. 103(a) as being unpatentable over each of Eckles and Heberling in view of either the Heckenburg reference (USP 5,279,972) or the Gjerde reference (USP 5,772,889). However, original independent claim 5 has now been amended as indicated above. For the Examiner's benefit, a marked-up copy of the claim has been submitted herewith. For the reasons discussed below, it is respectfully submitted that amended claim 5 and the claims that depend therefrom are clearly patentable over the prior art of record.

Amended claim 5 is directed to a method of managing a plating liquid composition. The method comprises sampling a plating liquid in a plating bath, separating and quantifying an additive in the sampled plating liquid using liquid chromatography, comparing the quantified value of the additive with a given predetermined concentration of the additive, and adding a solution including the additive to the plating liquid based on the compared result. The liquid chromatography comprises a process of *detecting the intensity of light scattered by an unevaporated solute remaining after the sampled plating liquid has been evaporated through spraying.*

As explained on pages 6 and 12 of the specification, the liquid chromatography process which includes detection of the intensity of light scattered by an unevaporated solute remaining after the sampled plating liquid has been evaporated through spraying, enables detection of any substances and provides sufficient detecting sensitivity at practical concentration levels of additives. For example, conventional ultraviolet electromagnetic radiation detection processes for analyzing the concentrations of chemical components in an electroplating bath do not allow detection of additives such as polymers because polymers do not absorb ultraviolet rays. However, the evaporative light-scattering detection process now recited in claim 5 allows detection of polymer components and, thus, analysis of a plating liquid containing polymer components as additives.

The Eckles reference discloses a method of analyzing concentrations of chemical components in an electroplating bath. The information obtained by such analysis of one or more baths is employed to control the concentrations in the bath (see Abstract). Analysis is performed using a high pressure liquid chromatography (HPLC) column 10, including an ultraviolet electromagnetic radiation detector (see column 3, line 68 - column 4, line 6; and column 4, lines 38-46). However, the Eckles reference does not disclose or suggest detecting the intensity of light scattered by a solute that remains unevaporated after the sampled plating liquid has been evaporated through spraying. In contrast, the Eckles reference uses a conventional ultraviolet electromagnetic radiation detection process (as described above) and, therefore, cannot be used to detect additives such as polymer components. Accordingly, it is submitted that the Eckles reference does not anticipate or even suggest the invention recited in amended claim 5.

The Heberling reference discloses a method of monitoring organic additives in acid copper plating baths. This reference teaches that high-performance liquid chromatography (HPLC) is used to measure components in acid copper plating baths (page 73, lines 13-37), and that a pulsed amperometric detector (PAD) is used to detect organic additives in acid copper plating baths (see page 74, lines 13-19). However, the Heberling reference does not disclose or suggest detecting the intensity of light scattered by an unevaporated solute remaining after the sampled plating liquid has been evaporated through spraying.

The Examiner asserts that the Heckenburg reference and the Gjerde reference teach or suggest removing unwanted ions prior to chromatographic separation. However, these references also do not disclose or suggest detecting the intensity of light scattered by an unevaporated solute remaining after the sampled plating liquid has been evaporated through spraying. Therefore, one of ordinary skill in the art would not be motivated by the Heckenburg reference and the Gjerde reference to modify the Eckles reference and/or the Heberling reference or to combine the references so as to obtain the invention recited in amended independent claim 5. Accordingly, it is respectfully submitted that amended claim 5 the claims that depend therefrom are clearly patentable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance. However, if the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact the Applicant's undersigned representative.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

5. (Amended) A method of managing a plating liquid composition, comprising:
- sampling a plating liquid in a plating bath;
 - separating and quantifying an additive in the sampled plating liquid [with] using liquid chromatography by detecting the intensity of light scattered by an unevaporated solute remaining after the sampled plating liquid has been evaporated through spraying;
 - comparing [a] the quantified value of [said] the additive with a given predetermined concentration [predetermined for said] of the additive; and
 - adding a solution including [said] the additive to [said] the plating liquid based on the compared result.
6. (Amended) A method of managing a plating liquid composition according to claim 5, further comprising removing ionic components from [said] the plating liquid [in advance] before [said] the additive is quantified.